

Application No.:  
Amendment Dated:  
Reply to Interview of:

09/727,855  
September 24, 2004  
September 16, 2004

### AMENDMENTS TO THE CLAIMS

Please amend the claims as follows:

#### LISTING OF CLAIMS:

Claim 1. (Currently amended) A process for producing carotenoids comprising cultivating in a culture medium a ~~recombinant~~ carotenoid producing recombinant organism containing at least one polynucleotide ~~encoding an active oxygen species-quenching factor~~ that is disrupted with a disruption cassette specific to the polynucleotide, wherein the recombinant organism belongs to the kingdom of *Monera*, *Protista* or *Fungi* and the ~~active oxygen species-quenching factor is encoded by a~~ polynucleotide is selected from the group consisting of [[:]

(a) SEQ ID NOs: 1 and or 4, or and a polynucleotide ~~polynucleotides~~ that hybridizes ~~hybridize~~ to the complement of SEQ ID NOs: 1 or 4 under high stringency hybridization and wash conditions, wherein said polynucleotide encodes ~~the hybridizing polynucleotides encode~~ a polypeptide having mitochondrial superoxide dismutase (SOD) activity [[:]

(b) ~~SEQ ID NOs: 2 or 6, or polynucleotides that hybridize to the complement of SEQ ID NO s: 2 or 6 under high stringency hybridization and wash conditions, wherein the hybridizing polynucleotides encode a polypeptide having cytoplasmic superoxide diemutase (SOD) activity; and~~

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~~(c) SEQ ID NOs: 3 or 8, or polynucleotides that hybridize to the complement of SEQ ID NOs: 3 or 8 under high stringency hybridization and wash conditions, wherein the hybridizing polynucleotides encode a polypeptide having catalase activity; and recovering carotenoids from the culture.~~

Claim 2. (Cancelled).

Claim 3. (Original) A process according to claim 1 wherein the recombinant organism belongs to a genus selected from the group consisting of *Erwinia*, *Rhodobacter*, *Myxococcus*, *Flavobacter*, *Paracoccus*, *Synechococcus*, *Synechocystis*, *Agrobacterium*, *Streptomyces*, *Haematococcus*, *Dunaliella*, *Phaffia*, *Xanthophyllomyces*, *Neurospora*, *Rhodotorula*, *Blakeslea*, and *Phycomyces*.

Claim 4. (Original) A process according to claim 3 wherein the recombinant organism is a strain of *P. rhodozyma*.

Claim 5. (Original) A process according to claim 4 wherein the recombinant organism is *P. rhodozyma* ATCC 98594.

Claim 6. (Previously cancelled).

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Claim 7. (Currently amended) A process according to claim 1 wherein the polynucleotide is active-oxygen-species-quenching-factor-is-encoded-by SEQ ID NO: 1.

Claim 8. (Currently amended) A recombinant organism for producing carotenoids comprising a ~~gene for~~ at least one polynucleotide active-oxygen-species-quenching-factor, which gene is substantially disrupted with a disruption cassette specific to the polynucleotide, wherein the recombinant organism belongs to the kingdom of Monera, Protista or Fungi and the polynucleotide is selected from the group consisting of SEQ ID NOs: 1 and 4, and a polynucleotide that hybridizes to the complement of SEQ ID NOs: 1 or 4 under high stringency hybridization and wash conditions, wherein said polynucleotide encodes a polypeptide having mitochondrial superoxide dismutase (SOD) activity gene.

Claim 9. (Cancelled).

Claim 10. (Original) A recombinant organism according to claim 8 ~~9~~ wherein the recombinant organism belongs to a genus selected from the group consisting of *Erwinia*, *Rhodobacter*, *Myxococcus*, *Flavobacter*, *Paracoccus*, *Synechococcus*, *Synechocystis*, *Agrobacterium*, *Streptomyces*, *Haematococcus*, *Dunaliella*, *Phaffia*, *Xanthophyllomyces*, *Neurospora*, *Rhodotorula*, *Blakeslea*, and *Phycomyces*.

Claim 11. (Cancelled).

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Claim 12. (Currently amended) A disruption cassette for disrupting a polynucleotide selected from the group consisting of SEQ ID NOs: 1 and 4, and a sequence that hybridizes to the complement of SEQ ID NOs: 1 or 4 under high stringency hybridization and wash conditions and encodes a polypeptide having mitochondrial superoxide dismutase (SOD) activity ~~gene coding for an active oxygen species quenching factor effective in carotenogenesis in a carotenogenic organism comprising a nucleotide sequence that codes for an active oxygen species quenching factor that is substantially identical to a part of a DNA sequence coding for an active oxygen species quenching factor and, the disruption cassette comprising a selectable marker gene and a fragment of the polynucleotide.~~

Claim 13. (Currently amended) A disruption cassette according to claim 12 wherein the disrupted polynucleotide is in an organism belonging belongs to a the kingdom selected from the group consisting of Monera, Protista and or Fungi.

Claim 14. (Original) A disruption cassette according to claim 13 wherein the organism belongs to a genus selected from the group consisting of *Erwinia*, *Rhodobacter*, *Myxococcus*, *Flavobacter*, *Paracoccus*, *Synechococcus*, *Synechocystis*, *Agrobacterium*, *Streptomyces*, *Haematococcus*, *Dunaliella*, *Phaffia*, *Xanthophyllomyces*, *Neurospora*, *Rhodotorula*, *Blakeslea*, and *Phycomyces*.

Claims 15-17. (Cancelled).

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Claim 18. (Currently amended) A recombinant polynucleotide DNA sequence ~~coding for an active oxygen species quenching factor~~ comprising a polynucleotide selected from the group consisting of SEQ ID NOs: 1 and 4, and a polynucleotide that hybridizes to the complement of SEQ ID NOs: 1 or 4 under high stringency hybridization and wash conditions, wherein said polynucleotide encodes a polypeptide having mitochondrial superoxide dismutase (SOD) activity ~~effective in carotenogenesis in a carotenogenic organism.~~

Claims 19-35. (Cancelled).

Claim 36. (Currently amended) A method for cloning a polynucleotide encoding a superoxide dismutase ~~gene encoding an active oxygen species quenching factor effective in carotenogenesis in a carotenogenic organism~~ comprising providing as a probe or primer a polynucleotide sequence selected from the group consisting of SEQ ID NOs: 1 and 4, and a polynucleotide that hybridizes to the complement of SEQ ID NOs: 1 or 4 under high stringency hybridization and wash conditions, wherein said polynucleotide encodes a polypeptide having mitochondrial superoxide dismutase (SOD) activity ~~encoding a polypeptide having the activity of a mitochondrial superoxide dismutase (SOD), a cytoplasmic superoxide dismutase (SOD) and/or a catalase.~~

Claims 37-38. (Cancelled).

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Claim 39. (Previously presented) A process according to claim 1 ~~38~~ wherein the ~~active oxygen species quenching factor is encoded by a~~ polynucleotide comprises ~~sequence comprising~~ SEQ ID NO: 1 or SEQ ID NO: 4.

Claims 40-43. (Cancelled).

Claim 44. (New) A process according to claim 1 wherein the polynucleotide is SEQ ID NO: 4.

Claim 45. (New) A recombinant organism according to claim 8 wherein the polynucleotide comprises SEQ ID NO: 1 or SEQ ID NO: 4.

Claim 46. (New) A recombinant organism according to claim 45 wherein the polynucleotide is SEQ ID NO: 1.

Claim 47. (New) A recombinant organism according to claim 45 wherein the polynucleotide is SEQ ID NO: 4.

Claim 48. (New) A disruption cassette according to claim 12 wherein the polynucleotide comprises SEQ ID NO: 1 or SEQ ID NO: 4.

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Claim 49. (New) A disruption cassette according to claim 48 wherein the polynucleotide is SEQ ID NO: 1.

Claim 50. (New) A disruption cassette according to claim 48 wherein the polynucleotide is SEQ ID NO: 4.

Claim 51. (New) A recombinant polynucleotide sequence according to claim 18 wherein the polynucleotide comprises SEQ ID NO: 1 or SEQ ID NO: 4.

Claim 52. (New) A recombinant polynucleotide sequence according to claim 51 wherein the polynucleotide is SEQ ID NO: 1.

Claim 53. (New) A recombinant polynucleotide sequence according to claim 51 wherein the polynucleotide is SEQ ID NO: 4.

Claim 54. (New) A method according to claim 36 wherein the polynucleotide comprises SEQ ID NO: 1 or SEQ ID NO: 4.

Claim 55. (New) A method according to claim 54 wherein the polynucleotide is SEQ ID NO: 1.

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Claim 56. (New) A method according to claim 54 wherein the polynucleotide is SEQ ID NO: 4.

Claim 57. (New) A vector comprising a disruption cassette according to claim 12.

Claim 58. (New) A vector comprising a polynucleotide selected from the group consisting of SEQ ID NOs: 1 and 4, and a polynucleotide that hybridizes to the complement of SEQ ID NOs: 1 or 4 under high stringency hybridization and wash conditions, wherein said polynucleotide encodes a polypeptide having mitochondrial superoxide dismutase (SOD) activity.

Claim 59. (New) A vector according to claim 58 wherein the polynucleotide comprises SEQ ID NO: 1 or SEQ ID NO: 4.

Claim 60. (New) A vector according to claim 58 wherein the polynucleotide is SEQ ID NO: 1.

Claim 61. (New) A vector according to claim 58 wherein the polynucleotide is SEQ ID NO: 4.



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Claim 62. (New) A process for producing carotenoids comprising cultivating in a culture medium a carotenoid producing recombinant microorganism containing at least one polynucleotide that is disrupted with a disruption cassette, which polynucleotide is selected from the group consisting of SEQ ID NOs: 1 and 4, and a polynucleotide that hybridizes to the complement of SEQ ID NOs: 1 or 4 under high stringency hybridization and wash conditions, wherein said polynucleotide encodes a polypeptide having mitochondrial superoxide dismutase (SOD) activity and recovering carotenoids from the culture.

Claim 63. (New) A recombinant microorganism for producing carotenoids comprising at least one polynucleotide disrupted with a disruption cassette, which polynucleotide is selected from the group consisting of SEQ ID NOs: 1 and 4, and a polynucleotide that hybridizes to the complement of SEQ ID NOs: 1 or 4 under high stringency hybridization and wash conditions, wherein said polynucleotide encodes a polypeptide having mitochondrial superoxide dismutase (SOD) activity.

Claim 64. (New) A disruption cassette for disrupting a polynucleotide in a microorganism, which disruption cassette comprises a selectable marker and a fragment of a polynucleotide that is selected from the group consisting of SEQ ID NOs: 1 and 4, and a polynucleotide that hybridizes to the complement of SEQ ID NOs: 1 or 4 under high stringency hybridization and wash conditions, wherein said polynucleotide encodes a polypeptide having mitochondrial superoxide dismutase (SOD) activity.